

WHAT IS CLAIMED IS:

1. A 3-dimensional image acquisition apparatus for acquiring images to be used for 3-dimensionally reconstructing an object by picking up the object
5 twice or more than twice in an image acquisition set including picking up at least once the object carrying a pattern projected onto it, the apparatus comprising:
 - a camera configured to pick up the object;
 - 10 a projection light source configured to project light for the purpose of projecting the pattern onto the object;
 - 15 a light projection information memory configured to store information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the image acquisition set;
 - 20 an image acquisition progress information memory configured to store information on the progress of image acquisition in the image acquisition set; and
 - 25 a controller configured to control the projection of light by the projection light source and the picking up by the camera on the basis of the information on projection of light stored in the light projection information memory and the information on the progress stored in the image acquisition progress information memory.

2. The apparatus according to claim 1, wherein

the information on projection of light includes information on the projection light source output from the projection light source.

3. The apparatus according to claim 1, wherein
5 the information on projection of light includes information on the camera output from the camera.

4. The apparatus according to claim 1, further comprising:

10 a proper image acquisition judging section configured to judge the appropriateness of the image acquisition that one of that is being conducted and has been conducted on the basis of one of the information on projection of light and the information on the progress; and

15 an indicator configured to show the judgment result of the proper image acquisition judging section.

5. The apparatus according to claims 1, further comprising:

20 a proper image acquisition judging section configured to judge the appropriateness of the image acquisition that one of that is being conducted and has been conducted on the basis of one of the information on projection of light and the information on the progress, wherein

25 the controller is adapted to reset the image acquisition progress information memory so as to make it store the progress information necessary for a first

imaging session when the proper image acquisition judging section determines that the current image acquisition is not appropriate.

6. The apparatus according to claim 1, further
5 comprising:

a photometric section configured to acquire information on the luminance of the object, wherein the information on projection of light includes information on the luminance acquired by the
10 photometric section.

7. The apparatus according to claim 1, wherein the camera includes one imaging optical system, and

15 the apparatus further comprises a stereo-adaptor having a light path dividing optical system adapted to enable the camera to acquire a plurality of images from different angles when connected to the imaging optical system of the camera.

8. The apparatus according to claim 1, further
20 comprising an illumination light source configured to illuminate the object when picking up the object by the camera.

9. The apparatus according to claim 8, wherein
25 the information on projection of light includes information on the illumination light source output from the illumination light source.

10. The apparatus according to claim 1, further

comprising an operation section configured to input the information on projection of light.

11. The apparatus according to claim 1, wherein the projection light source is adapted to project light 5 at a first imaging session of the image acquisition set.

12. A light projection unit to be connected to a camera adapted to continuously picking up an object and output timing signals for one of the timing of 10 picking up the object and the timing of projecting light for the purpose of projecting a pattern onto the object, the unit comprising:

15 a projection light source configured to project light for the purpose of projecting the pattern onto the object;

20 a light projection information memory configured to store information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the continuous picking up;

an image acquisition progress information memory configured to store information on the progress of the continuous picking up; and

25 a controller configured to control the projection of light by the projection light source in synchronism with the timing signal and on the basis of the information on projection of light stored in the light

projection information memory and the information on the progress stored in the image acquisition progress information memory.

13. The apparatus according to claim 12, wherein
5 the projection light source is adapted to project light in synchronism with a first imaging session of the continuous picking up.

14. A 3-dimensional reconstruction system for acquiring images to be used for 3-dimensionally
10 reconstructing an object by picking up the object twice or more than twice in an image acquisition set including picking up at least once the object carrying a pattern projected onto it, the system comprising:

15 a camera configured to pick up the object;
a projection light source configured to project light for the purpose of projecting the pattern onto the object;

20 a light projection information memory configured to store information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the image acquisition set;

25 an image acquisition progress information memory configured to store information on the progress of image acquisition in the image acquisition set;

a controller configured to control the projection of light by the projection light source and the picking

up by the camera on the basis of the information on projection of light stored in the light projection information memory and the information on the progress stored in the image acquisition progress information
5 memory; and

a computer configured to 3-dimensionally reconstructing the object on the basis of the images obtained by the camera.

15. A 3-dimensional image acquisition method
10 for obtaining images to be used for 3-dimensionally reconstructing an object by picking up the object twice or more than twice in an image acquisition set including picking up at least once the object carrying a pattern projected onto it, the method comprising:

15 acquiring information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the image acquisition set;

20 storing information on the progress of image acquisition in the image acquisition set; and

conducting the image acquisition set on the basis of the information on projection of light acquired in the acquiring information and the information on the progress stored in the storing information.

25 16. A 3-dimensional image acquisition method for obtaining images to be used for 3-dimensionally reconstructing an object by picking up the object

twice or more than twice in an image acquisition set including picking up at least once the object carrying a pattern projected onto it, the method comprising:

5 acquiring information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the image acquisition set;

10 storing information on the progress of image acquisition in the image acquisition set; and

10 conducting the image acquisition, while projecting light for the purpose of projecting the pattern when the information on the progress indicates that a first imaging session is in progress.

17. The method according to claim 16, wherein
15 an image acquisition is conducted on the basis of the information on projection of light when the information on the progress indicates that a second or a subsequent imaging session is in progress.

18. A 3-dimensional image acquisition method
20 for obtaining images to be used for 3-dimensionally reconstructing an object by picking up the object twice or more than twice in an image acquisition set including picking up at least once the object carrying a pattern projected onto it, the method comprising:

25 acquiring information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the image

acquisition set, which time can be that of a first imaging session;

storing information on the progress of image acquisition in the image acquisition set; and

5 conducting the image acquisition, while projecting
light for the purpose of projecting the pattern when
the information on the progress indicates that the
first imaging session is in progress.

19. The method according to claim 18, wherein
10 an image acquisition is conducted on the basis of the
information on projection of light when the information
on the progress indicates that a second or a subsequent
imaging session is in progress.

15 20. A method of projecting light from a light projection unit adapted to continuously pick up an object and project light for the purpose of projecting a pattern on the object while conducting the picking up, the method comprising:

20 acquiring information on projection of light
including information on the time for projecting light
for the purpose of projecting the pattern in the
continuous picking up;

storing information on the progress of the continuous picking up; and

25 projecting light for the purpose of projecting
the pattern in synchronism with the picking up and on
the basis of the information acquired in the acquiring

information and the information on the progress stored in the storing information.

21. A method of projecting light from a light projection unit adapted to continuously pick up an object and project light for the purpose of projecting a pattern on the object while conducting the picking up, the method comprising:

10 acquiring information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the continuous picking up;

 storing information on the progress of the continuous picking up; and

15 projecting light for the purpose of projecting the pattern in synchronism of a first session of the picking up when the information on the progress indicates that the first session is in progress.

22. The method according to claim 21, wherein a light projection for the purpose of projecting the pattern is conducted on the basis of the information on projection of light when the information on the progress indicates that a second session of the picking up is in progress.

25 23. A method of projecting light from a light projection unit adapted to continuously pick up an object and project light for the purpose of projecting a pattern on the object while conducting the picking

up, the method comprising:

acquiring information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the 5 continuous picking up, which time can be that of a first session of the picking up;

storing information on the progress of the continuous picking up; and

projecting light for the purpose of projecting the 10 pattern in synchronism of the first session when the information on the progress indicates that the first session is in progress.

24. The method according to claim 23, wherein a light projection for the purpose of projecting the pattern is conducted on the basis of the information 15 on projection of light when the information on the progress indicates that a second session of the picking up is in progress.

25. A 3-dimensional image acquisition apparatus for acquiring images to be used for 3-dimensionally reconstructing an object by picking up the object twice or more than twice in an image acquisition set including picking up at least once the object carrying a pattern projected onto it, the apparatus comprising:

25 a camera for picking up the object;

projection light emission means for projecting light for the purpose of projecting the pattern onto

the object;

light projection information storing means for storing information on projection of light including information on the time for projecting light for 5 the purpose of projecting the pattern in the image acquisition set;

image acquisition progress information storing means for storing information on the progress of image acquisition in the image acquisition set; and

10 control means for controlling the projection of light by the projection light emission means and the picking up by the camera on the basis of the information on projection of light stored in the light projection information storing means and the 15 information on the progress stored in the image acquisition progress information storing means.

26. A light projection unit to be connected to a camera adapted to continuously picking up an object and output timing signals for one of the timing of picking up the object and the timing of projecting light for 20 the purpose of projecting a pattern onto the object, the unit comprising:

25 projection light emission means for projecting light for the purpose of projecting the pattern onto the object;

light projection information storing means for storing information on projection of light including

information on the time for projecting light for the purpose of projecting the pattern in the continuous picking up;

5 image acquisition progress information storing means for storing information on the progress of the continuous picking up; and

10 control means for controlling the projection of light by the projection light emission means in synchronism with the timing signal and on the basis of the information on projection of light stored in the light projection information storing means and the information on the progress stored in the image acquisition progress information storing means.

27. A 3-dimensional reconstruction system for 15 acquiring images to be used for 3-dimensionally reconstructing an object by picking up the object twice or more than twice in an image acquisition set including picking up at least once the object carrying a pattern projected onto it, the system comprising:

20 a camera for picking up the object;

projection light emission means for projecting light for the purpose of projecting the pattern onto the object;

25 light projection information storing means for storing information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the image

acquisition set;

image acquisition progress information storing means for storing information on the progress of image acquisition in the image acquisition set;

5 control means for controlling the projection of light by the projection light emission means and the picking up by the camera on the basis of the information on projection of light stored in the light projection information storing means and the 10 information on the progress stored in the image acquisition progress information storing means; and

computing means for 3-dimensionally reconstructing the object on the basis of the images obtained by the camera.